Docket No.: 1906-0128P
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Miroslaw Z. BOBER

Application No.: 09/559,415 Confirmation No.: 1497

Filed: April 26, 2000 Art Unit: 2162

For: METHOD AND APPARATUS FOR REPRESENTING AND SEARCHING FOR AN OBJECT USING SHAPE Examiner: B. N. To

AMENDED APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Madam:

In response to the Notice of Non-Compliant dated June 9, 2009, this amended Appeal Brief is hereby submitted within the time frame required in the Notice.

The fees required under § 41.20(b)(2) are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1205.2:

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is:

Mitsubishi Denki Kabushiki Kaisha

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 14 claims pending in application.

B. Current Status of Claims

1. Claims canceled: 1-5, and 11-32
2. Claims withdrawn from consideration but not canceled: None
3. Claims pending: 6-10 and 33-41
4. Claims allowed: None
5. Claims rejected: 6-10 and 33-41

C. Claims On Appeal

The claims on appeal are claims 6-10 and 33-41

IV. STATUS OF AMENDMENTS

Applicant filed an Amendment on January 9, 2009, amending claims 6 and 7, canceling claims 10, 33-35 and 38-40, and adding new claim 42. Applicant believed the amended to have

been entered, but in view of the Notification of Non-Compliant Appeal Brief received June 9, 2009 and the discussion with Examiner To, Applicant understands that the January 9, 2009 amendment was not entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to searching for an image or sequence of images (still or video image) containing a two-dimensional projection of a specific three-dimensional object of interest to the searcher. This is done by searching through stored representations of images or sequences of images. The stored representations represent each image or sequence of images using object descriptors for three-dimensional objects in the image or sequence of images. Each object descriptor includes a plurality of perspective view descriptors (associated together to form an object descriptor) which represent different two-dimensional perspective views of the three-dimensional object. The object descriptor includes a view descriptor of the object as it appears in the image (one two-dimensional perspective view) and view descriptors of the object in other two-dimensional perspective views (not appearing in the image or sequence of images). See for example, the different views of the 3-D cylinder object illustrated in Figure 2 of the Specification. A search is initiated by inputting a query, for example, in the form of an outline which is the outline of the shape of a two-dimensional projection of the specific three-dimensional object of interest to the searcher. An object descriptor for the query object is derived and then compared with the stored object descriptors. More specifically, the query descriptor is compared with each of the plurality of perspective view descriptors in the stored object descriptor. If the query descriptor matches any of the perspective view descriptors, the overall object descriptor is considered a match and the corresponding image or sequence of images is retrieved, even if the perspective view of the object in the query does not match the perspective view of the object in the image or sequence of images.

Independent claim 6 defines a method of searching for a query object in an image or sequence of images by processing signals corresponding to the images using a processor. (Specification p. 1, lines 4-5 and Fig. 1) The method includes, *inter alia*, providing a plurality of stored image representations of three-dimensional objects, each image representation being

associated with an object descriptor, each object descriptor including a plurality of view descriptors, each view descriptor representing the outline of the shape of a projection of each of the three-dimensional objects from a different perspective view of the three-dimensional object; (Specification p. 4, line 8 to p. 5, line 17, Figs. 1-3) inputting a query in the form of at least a two-dimensional outline of an object; (Specification page 6, lines 11-16 and lines 19-22, and Fig. 5) deriving a query object descriptor of the query object; (Specification page 6, lines 17-18 and Fig.5) comparing said query object descriptor with at least one of said object descriptors; (Specification page 7, lines 3-21, page 8, lines 1-5, page 8, line 21 to page 9, line 11, and Figs. 3 and 5) selecting and displaying at least one result corresponding to one of the image representations containing an object for which comparison between the associated object descriptor and the query object descriptor indicates a degree of similarity between the query object and said object. (Fig. 5, Specification page 9, lines 12-19).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Claims 6-10 and 33-41 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Eakins et al., "Retrieval of trade mark images by shape feature-the ARTISAN project), May 22, 1996 ("Eakins") in view of U.S. Patent No. 6,801,641 B2 to Eraslan ("Eraslan"), and further in view of Japanese Publication No. JP 06-215105 to Haruo et al. ("Haruo").

VII. ARGUMENT

Claims 6-10 and 33-41

The rejection of claims 6-10 and 33-41 as unpatentable over the combination of Eakins, Eraslan and Haruo is improper because the combination fails to disclose "a plurality of stored image representations of three-dimensional objects, each image representation being associated with an object descriptor, each object descriptor including a plurality of view descriptors, each view descriptor representing the outline of the shape of a projection of each of the three-dimensional objects from a different perspective view of the three-dimensional object" as recited in claims 6 and 33, from which claims 7-10 and 34-41 depend.

As discussed in the Specification, various methods, e.g., chain coding, quad-tree, and curvature scale space representations, of representing shapes of objects in images are known in

the art. In addition, methods of searching images using stored representations are known. However, these known methods have disadvantages. In most cases, an object appearing in an image or video sequence is a projection of a 3-dimensional real object onto a 2-dimensional plane. The 2-dimensional shape or outline of an object appearing in an image depends on factors such as the viewing position, viewing angle, and camera and optical system parameters. Objects will therefore have different outlines associated with different views. (See 3-D cylinder object illustrated in Fig. 2 of the Specification) However, the known methods of representing images treat these different outlines as different objects. As a result, if, for example, a user inputs a query based on a front view of an object A, and object A only appears in a video sequence from the rear and side view, known methods will not successfully match the query view of object A with the stored images including object A from the different view. The present invention overcomes this disadvantage with known methods by providing a system which associates different perspective views of a three-dimensional object appearing in an image or sequence of images.

Accordingly, independent claim 6 defines a method of searching for a query object in an image or sequence of images by processing signals corresponding to the images using a processor. The method includes, *inter alia*, providing a plurality of stored image representations of three-dimensional objects, each image representation being associated with an object descriptor, each object descriptor including a plurality of view descriptors, each view descriptor representing the outline of the shape of a projection of each of the three-dimensional objects from a different perspective view of the three-dimensional object; inputting a query in the form of at least a two-dimensional outline of an object; deriving a query object descriptor of the query object; comparing said query object descriptor with at least one of said object descriptors; selecting and displaying at least one result corresponding to one of the image representations containing an object for which comparison between the associated object descriptor and the query object descriptor indicates a degree of similarity between the query object and said object.

In rejecting claim 6, the Examiner asserts that "it would have been obvious to one [of] ordinary skill in the art at the time of the invention was made to modify Eakins' system to

include the different view of three-dimensional stored object in the database as taught by Eraslan in order to provide a faster search and retrieval system." In addition, the Examiner asserts that "Haruo also discloses providing a plurality of stored image representations of tree-dimensional [sic] objects, each image representation being associated with an object descriptor, each object descriptor including a plurality [of] view descriptors, each view descriptor of representing the outline of the shape of a projection of each one of the three-dimensional objects from a different perspective view of the three-dimensional object." Therefore, the Examiner concludes that because Haruo allegedly suggests an object having different shapes, it would have been obvious to "modify Eakins and Eraslan to include each view descriptor representing a shape of an object as disclosed in Haruo in order to allow the retrieval of an image using shape." The Examiner's assertions are unfounded for the following reasons.

First, the Examiner's conclusion of obviousness is based on an incorrect reading of Eraslan. On page 8 of the Office action dated July 10, 2008 ("Action"), the Examiner asserts that "Eraslan teaches providing a plurality of stored image representations of tree-dimensional [sic] objects, each image representation being associated with an object descriptor, each object descriptor including a plurality [of] view descriptors, each view descriptor of [sic] representing the outline of the shape of a projection of each one of the three-dimensional objects from a different perspective view of the three-dimensional [object]." To support this assertion, the Examiner points to column 4, lines 2-8 and Fig. 8 of Eraslan.

Although Fig. 8 of Eraslan illustrates different perspective views of a nose, Eraslan fails to disclose that each of these different perspective views of the nose attribute are stored as part of the object descriptor for the nose attribute or that a perspective view represents the outline of the shape of a two-dimensional projection of the nose from a different perspective. To the contrary, Fig. 8 of Eraslan illustrates the fact that with the face-attribute index (e.g., 01) and the specific face-feature surface code (142), a complete three-dimensional color face-feature *surface* which can be rendered graphically in the frontal view, left-profile view, right-profile view and all possible angled views of observation and analysis can be complied. See column 4, lines 35-60 and Figs 7-13. Although Eraslan discloses that these 3-D surface maps can be used to analyze two-dimensional mug shots, nowhere in Eraslan is there any disclosure or suggestion of indexing

outlines of the shape of a two-dimensional projection of the three dimensional facial feature as claimed. Therefore, even if, *arguendo*, one where to equate the shape codes of Eraslan as being equivalent to the claimed view descriptors, the shape codes of Eraslan do not represent different outlines of the shape of a two-dimensional projection of the perspective view of the same 3-D object, but rather entire 3-D surface maps for different objects in the facial feature family. Accordingly, the Examiner's assertion that Eraslan provides object descriptors as claimed is unfounded.

Second, the Examiner's assertion that Haruo also discloses providing object descriptors as claimed in incorrect. Although Haruo discloses a method for creating two-dimensional projections from three-dimensional geometric shape information, nowhere in Haruo is there any disclosure or suggestion of storing perspective view descriptors representing the outline of the shape of two-dimensional projection of a three-dimensional object in an image or sequence of images as claimed. At best, Haruo merely discloses a system for creating projections, not for creating view descriptors representing the outline of the shape of a two-dimensional projection as claimed. Therefore, even if one skilled in the art were motivated to combine Eraslan and Haruo, the combination would merely provide a system for creating geometric shape information for numerous facial features and a system for creating two-dimensional projections of the three-dimensional facial surfaces once constructed. However, the combination would still fail to teach providing perspective view descriptors as claimed.

Finally, although Eakins discloses a system for searching for and retrieving similar images based in part on similarity between shape descriptors. The shape descriptors of Eakins are not equivalent to the claimed object or view descriptors. First, the shape descriptors of Eakins are not representative of three-dimensional objects within the stored images. To the contrary, the shape descriptors of Eakins are representative of an entire image, not a two-dimensional projection of a three-dimensional object as claimed. Second, the shape descriptors of Eakins are based on individual boundaries or families of boundaries extracted from a stored image (i.e., the boundary exists in the image), not different perspective views of a three-dimensional object which are not in the image.

Since Eakins, Eraslan, and Haruo each fail to disclose or suggest a method of searching for a query object in an image or sequence of images that includes, *inter alia*, providing a plurality of stored image representations of three-dimensional objects, each image representation being associated with an object descriptor, each object descriptor including a plurality of view descriptors, each view descriptor representing the outline of the shape of a projection of each of the three-dimensional objects from a different perspective view of the three-dimensional object as claimed, the combination of these three references cannot possibly disclose or suggest said feature. Therefore, even if one skilled in the art had some rationale to combine Eakins, Eraslan, and Haruo, which Appellant does not concede, the combination would still fail to render claim 6 unpatentable because the combination fails to disclose each and every claimed element.

Claims 7-10 and 33-41 are patentable over the combination of Eakins, Eraslan, and Haruo for at least those reasons presented above with respect to claim 6.

VIII. CLAIMS

A copy of the claims involved in the present appeal is attached hereto as Appendix A. The claims in Appendix A do not include the amendments filed by Applicant on January 9, 2009.

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Respectfully submitted,

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APPENDIX A

Claims Involved in the Appeal of Application Serial No. 09/559,415

6. (Previously Presented) A method of searching for an object in still or video images by processing signals corresponding to the images, the method comprising:

providing a plurality of stored image representations of three-dimensional objects, each image representation being associated with an object descriptor, each object descriptor including a plurality of view descriptors, each view descriptor representing the outline of the shape of a projection of each of the three-dimensional objects from a different perspective view of the three-dimensional object;

inputting a query in the form of at least a two-dimensional outline of an object;

deriving a query object descriptor of the query object;

comparing said query object descriptor with at least one of said object descriptors;

selecting and displaying at least one result corresponding to one of the image representations containing an object for which comparison between the associated object descriptor and the query object descriptor indicates a degree of similarity between the query object and said object.

7. (Previously Presented) A method as claimed in claim 6 wherein a query is input in the form of two or more two-dimensional outlines of an object, and wherein a query view descriptor is derived for each said outline, and wherein the step of comparing comprises comparing each said query view descriptor with each view descriptor in each stored object descriptor to derive a plurality of view-similarity values.

8. (Previously Presented) A method as claimed in claim 7 wherein the view-similarity values are analyzed to derive object similarity values.

9. (Previously Presented) A method as claimed in claim 6, wherein at least some of the object descriptors include view-independent descriptors which are related to shape and/or size of

the object, and wherein the method comprises inputting a view-independent query value and the step of comparing compares the query value with the view-independent descriptors for the stored object descriptors.

10. (Previously Presented) A method as claimed in claim 6, wherein the query descriptor is derived using a curvature scale space representation of a query object outline.

33. (Previously Presented) A method of searching for an object in still or video images by processing signals corresponding to images, the method comprising:

receiving a query descriptor representing a two-dimensional view of a query object;

comparing the query descriptor with a plurality of stored object descriptors each representing a three-dimensional object, each object descriptor including a plurality of view descriptors, each view descriptor representing the outline of the shape of a projection of each of the three-dimensional objects from a different perspective view of the three-dimensional object, each stored object descriptor being associated with an image representation of the object; and

selecting the three-dimensional object and associated image representation when of the respective stored object descriptors matches the query descriptor.

34. (Previously Presented) The method of searching according to claim 33, wherein the query descriptor is derived using a curvature scale space representation of an outline of the query object.

35. (Previously Presented) The method of searching according to claim 34, wherein the stored descriptor is derived using a curvature scale space representation of an outline of the three-dimensional object.

36. (Previously Presented) The method of claim 6, further comprising:

deriving an object descriptor for an object in an image by:

deriving a view descriptor of a first outline of a three-dimensional object in the image,

deriving at least one additional view descriptor of the outline of the object in a different perspective view from the perspective view in the image, and

associating the two or more view descriptors to form the object descriptor.

37. (Previously Presented) The method of claim 6, wherein said selecting and displaying includes selecting and displaying an image representation of an object having a different perspective view from perspective view of said query object based on said query object matching with at least two view descriptors including a view descriptor not representing perspective view of the object in the image representation.

38. (Previously Presented) The method of claim 33 wherein one of the view descriptors corresponds to a view of the object as the object appears in the respective image representation.

39. (Previously Presented) The method of claim 33 wherein one of the view descriptors corresponds to a perspective view of the object different from the perspective view of the object as the object appears in the respective image.

40. (Previously Presented) The method of claim 33, wherein said selecting includes selecting and displaying an image representation including an object having a different perspective view from perspective view of said query object based on said query object matching with at least two view descriptors including a view descriptor not representing view of the object in the image.

41. (Previously Presented) The method of claim 6, wherein each said view descriptor is a different representation of the object from a different perspective view of the three-dimensional object.

APPENDIX B

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or entered by or relied upon by the examiner is being submitted.

APPENDIX C

No related proceedings are referenced in II. above, hence copies of decisions in related proceedings are not provided.